

Abstract Submitted  
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**The role of Oxygen triplets in plasma diagnostic** VLADIMIR MILOSAVLJEVIC, ALBERT ELLINGBOE, STEPHEN DANIELS, NCPST, DCU, Ireland — The oxygen 777nm triplet is very important for the measurement of atomic oxygen in low pressure plasmas, since the 777.42nm spectral line is frequently used for actinometry. Cascade processes from the 6s and 5s energy states to the upper level of the 777nm triplet correlate with errors in the measurement of atomic densities. In this paper we present the intensity dependence of the oxygen 777 (777.19nm, 777.42nm, 777.54nm), 543 (543.69nm, 543.58nm, 543.52nm) and 645 (645.60nm, 645.44nm, 645.36nm) triplets on plasma chemistry. The spectral lines from the 777 triplet belong to the transition 3s–3p and multiplet  $^5S^0$ - $^5P$ . They have same lower energy ( $E_f$ ) level of 9.15eV, with upper energy ( $E_i$ ) levels of about 10.74eV. The lines from the 543 and 645 triplets have different  $E_i$  levels; for the 543 triplet all spectral lines have  $E_i$ =13.02eV, while for the spectral lines from the 645 triplet  $E_i$  are 12.66eV. The  $E_f$  level for spectral lines from the 645 and 543 triplets are  $E_i$  level for spectral lines from the 777 triplet. The experiment are performed in a Inductive plasma source operated at 13.56MHz, with 4MHz substrate bias. Working gases are Ar-O<sub>2</sub>-C<sub>4</sub>F<sub>8</sub> mixtures, with the addition of helium at the back side of a Oxide coated wafer. Gas pressure is varied from 2 to 6 Pa; flows of 300sccm of Ar and O<sub>2</sub> and C<sub>4</sub>F<sub>8</sub> are both varied from 0 to 20 sccm. Source power is varied from 0 to 600 W, and bias power from 0 to 1200 W.

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